© 2016. Indian Journal of Arachnology 5 (1-2): 61-66 ISSN 2278-1587 (Online)

A PLEA FOR TAXONOMIC DRAWINGS AND AGAINST PURE PHOTO-TAXONOMY

Peter Jäger
Arachnology, Senckenberg Research Institute, Senckenberganlage 25,
60325 Frankfurt am Main, Germany
peter.jaeger@senckenberg.de

Taxonomy includes discovering, naming and describing biological species and making this biodiversity available to other scientists as well as to a wider community. Descriptions of individual species should be comprehensible so that the described taxa can be recognized in the future by subsequent researchers (e.g., Dubois, 2003). The description of a new species usually includes various aspects such as diagnosis, description etc. These aspects, and the morphological or anatomical structures in question, can vary from one taxonomic group to another.

In spiders (Araneae), copulatory organs were included since the first publication with valid taxonomic names (Clerck, 1757; Figure 1). The main character at that time, however, was the habitus of the particular spider species. Copulatory organs or eye arrangements were illustrated for only some of the 66 nominal species depicted. In subsequent publications, copulatory organs were increasingly illustrated more regularly (e.g., Koch, 1875; O. Pickard-Cambridge, 1899). Later, they were included in every description (e.g., Kaston, 1945; Wiehle, 1956; Huber, 2011), since they were considered crucial for distinguishing between different, and especially closely related, taxa (Grasshoff, 1968).

The act of identifying a species was not the only reason to delineate special morphological details of a palp or an epigyne. Tracing evolutionary lineages and understanding evolutionary mechanisms or phylogenetic relationships were also important reasons to invest time to depict these structures (e.g., Hormiga, 1994). Scientific illustration also became a source of information for subsequent researchers, when newly discovered character complexes within particular studies were considered and older literature was gleaned for information. Line drawings were for a long time the only information source, until photographs with analogue (and later digital) cameras or with scanning electron microscopes became possible. These methods have the advantage that they show real structures and the entire set of morphological details, i.e. artefacts are minimised. By contrast, a line drawing was – and still is – an interpretation and in some cases a somewhat schematic picture of real structures (Figures 2–3). The advantage of drawings is that traits that are not important, or are even disturbing (e.g., setae covering the embolus), can be omitted. At the same time, essential structures can be stressed and are therefore much easier to recognize, especially during the process of identification. In this regard, photos can be considered a helpful additional source of information, e.g. on the entire set of setae, bristles and spines of a male palp in the case for instance, when some of them have to be removed in order to see and illustrate all important structures (Figures 4–5). However, a photo should never be considered as a replacement for a scientific drawing.

In the last 10 years, the method of image stacking in combination with computer-driven microscopes and digital photography, as well as subsequent use of stacking software, has facilitated

sharp photographs of even tiny details (Figure 6). Excellent examples can be seen in Lin & Li (2013) for example. Here, image stacking was used as a supplementary method to the traditional scientific drawings. Some photos are excellent (Figure 6), but even in these photos, not all structures can be discerned. For example, how exactly does the embolus tip run over its entire length in the distal half of the male bulb? In some cases, it might even be worth in scientific drawings to add supplementary drawings that help to better understand the course of the male or female copulatory organs (Jäger & Rheims, 2008: figs 10, 13, 28, 30 etc.).

Nowadays, an increasing number of papers with scientific descriptions of new species exclusively use photographs as visual information about morphological details. The reason why I write this short opinion piece is that, in many cases, these 'photo-taxonomical' descriptions are not always adequate to recognize all the necessary details to discern one species from another, or even to recognize morphological structures at all. Even if a taxon can be recognised today, what about a closely related taxon discovered in the future with slight differences in morphology which are not traceable in the photo? Moreover, a photographic illustration as a source of information for subsequent scientists is limited, since less details can be observed especially in bad photographs (which may follow publications with good photos, an unfortunate fact also observed in the last years). What is the reason for this trend?

I see multiple reasons: 1. Digital photos are possible and affordable for almost everyone. 2. Scientific journals increasingly accepted these kinds of papers and guidelines do not permit the rejection of a manuscript solely by having no drawings. 3. Lack of drawing devices or drawing competence/teachers at the particular institution. 4. Pressure of impact factor and the so-called acceleration of biodiversity description ruling out time-investment in line drawings.

First of all, I would like to point out that I consider a scientific drawing still necessary to show all details for identifying species in the future. There is no photograph that can interpret, abstract, reduce and highlight at the same time. Only when a scientist understands all structures, can he or she illustrate them properly and only then, is it possible for subsequent scientists to recognize essential characters for identifying spider species. Moreover, line drawings are not likely to loose details when they are printed (probably with the only being exception when they are printed at a too small scale). By contrast, I saw many photos that were printed too dark or too small to recognise important structures. In some examples, even arrows and lettering could not enlighten which structure was meant. The process of identification was absolutely impeded. Such poor-quality photos were almost always included in new descriptions, but not in identification keys. This means, that if a key is necessary, drawings for all the species with (poor) photos have to be re-drawn to make identification possible. In other words, some scientists save time by publishing shorter descriptions with less time investment and leave additional work behind for other scientists.

Therefore, I strongly recommend that: 1. Every taxonomist includes scientific drawings as part of the description of new species and 2. Journals as well as referees reject pure photo-taxonomy. The advantages of publications with taxonomic drawings are: 1. All essential details are readily recognisable and can be indicated easily (Figures 2–3). 2. The identification process is guaranteed (with good drawings). 3. The set of characters illustrated remains as a valuable resource for subsequent researchers.

Beside many good reasons for describing new species, Pierre Bonnet mentioned in his

"Chant de arachnologistes", one that is probably inherited in every scientist however humble he or she will be: to receive a kind of honour for having described new species and to become in a way immortal. The positive reputation of a superficially diligent taxonomist can, however, be inverted if the quality of scientific papers decreases. Therefore, a compromise between accelerating the description of the planet's biodiversity and maintaining the necessary standards to describe and recognise species by means of these descriptions should be considered.

Do we really want to have future generations of arachnologists pressing the button on a camera and claiming this is taxonomy? Do we want to have many of species described, but not recognisable in the future, i.e. compiling worthless names not connected to a natural organism. This scenario achieves a new dimension considering the papers of Marshall & Evenhuis (2015) and Pape (2016), where doubt was expressed that a name-bearing type specimen should even be deposited. Ceriaco *et al.* (2016) rejected this idea in order to avoid misconceptions in taxonomy in the future. Only if one understands a structure, can this trait be illustrated properly and should be done from a type specimen that is deposited somewhere where it is available to the scientific community and can be re-examined by future generations of researchers.

ACKNOWLEDGEMENTS

The author thanks Priyanka Hadole for the invitation to write this small opinion for this special issue, Shuqiang Li for using his excellent photograph and Cristina Rheims and Jason Dunlop for checking a final draft of the manuscript.

REFERENCES

Ceríaco, L.M.P., Gutiérrez, E.E. & Dubois, A. (2016). Photography-based taxonomy is inadequate, unnecessary, and potentially harmful for biological sciences. *Zootaxa*, 4196 (3): 435-445.

Clerck, C. (1757). *Svenska spindlar, uti sina hufvud-slågter indelte samt under några och sextio särskildte arter beskrefne och med illuminerade figurer uplyste*. Stockholmiae, 154 pp.

Dubois, A. (2003). The relationships between taxonomy and conservation biology in the century of extinctions. C. R. Biologies, 326: S9−S21.

Grasshoff, M. (1968). Morphologische Kriterien als Ausdruck von Artgrenzen bei Radnetzspinnen der Subfamilie Araneinae (Arachnida: Araneae: Araneidae). *Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft*, 516: 1−100.

Hormiga, G. (1994). A revision and cladistic analysis of the spider family Pimoidae (Araneoidea: Araneae). *Smithsonian Contributions to Zoology,* 549: 1−104.

Huber, B.A. (2011). Revision and cladistic analysis of Pholcus and closely related taxa (Araneae, Pholcidae). *Bonner Zoologische Monographien*, 58: 1−509.

Jäger, P. & Rheims, C.A. (2008). On the genera *Origes* Simon 1897, *Prusias* O.P.-Cambridge 1892, *Tibellomma* Simon 1903 and *Paenula* Simon 1897 from South and Central America (Araneae: Sparassidae). *Senckenbergiana biologica*, 88 (1): 29–39.

Kaston, B.J. (1945). New spiders in the group of Dionycha with notes on other species. *American Museum Novitates*, 1290: 1−25.

Koch, L. (1875). Die Arachniden Australiens. *Nürnberg*, 1: 577−740.

Lin, Y.C. & Li, S.Q. (2013). Five new minute orb-weaving spiders of the family Mysmenidae from China (Araneae). *Zootaxa*, 3670: 449−481.

Marshall, S.A. & Evenhuis, N.L. (2015). New species without dead bodies: a case for photo-based descriptions, illustrated by a striking new species of *Marleyimyia* Hesse (Diptera, Bombyliidae) from South Africa. *ZooKeys*, 525: 117–127.

Pape T. (2016). Taxonomy: species can be named from photos. *Nature*, 537: 307.

Pickard-Cambridge, O. (1889). Arachnida. Araneida. *In*: Biologia Centrali-Americana, Zoology. London, 1: 1−56.

Wiehle, H. (1956). Spinnentiere oder Arachnoidea (Araneae). 28. Familie Linyphiidae-Baldachinspinnen. *Tierwelt Deutschlands*, 44: 1−337.

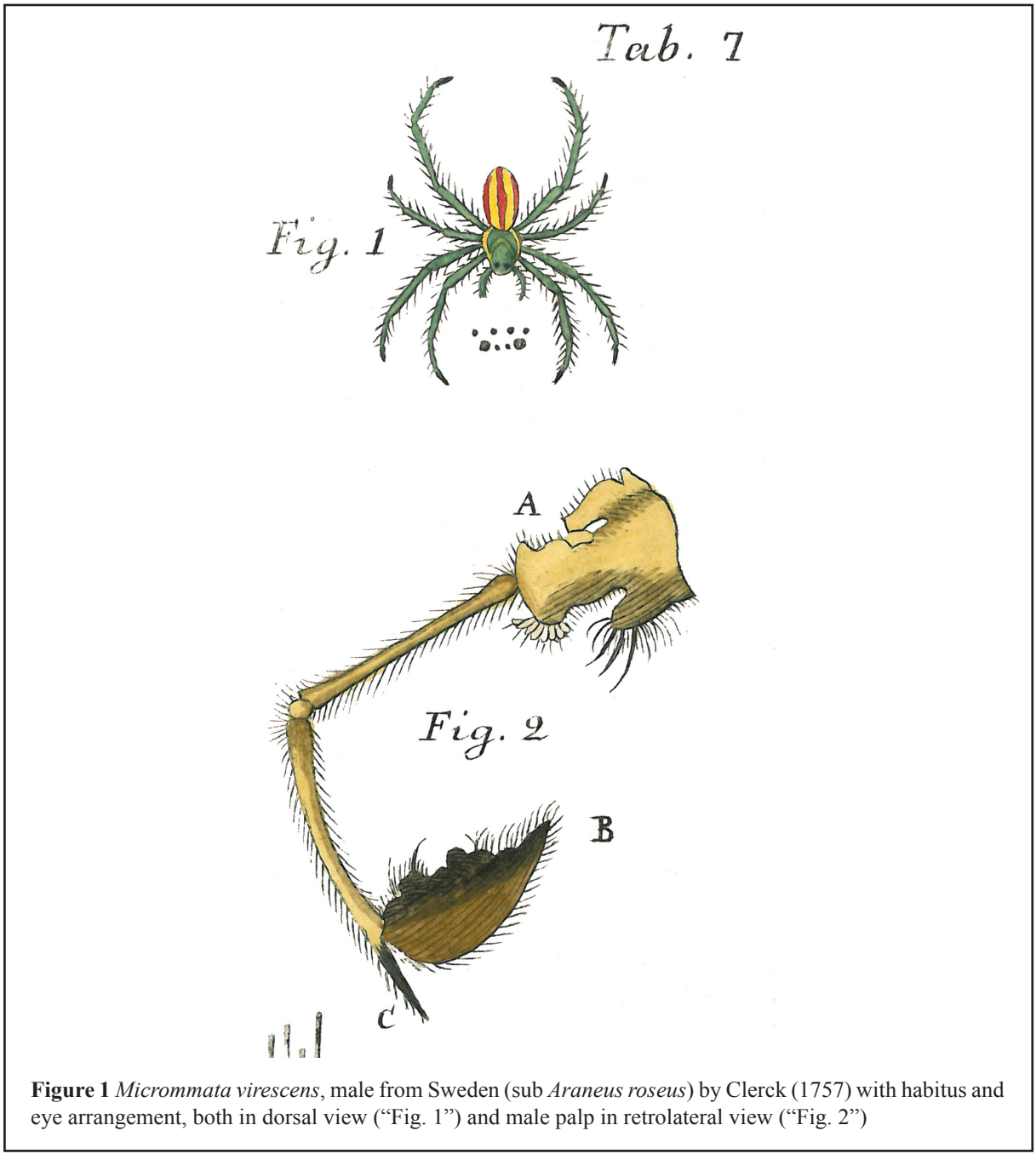
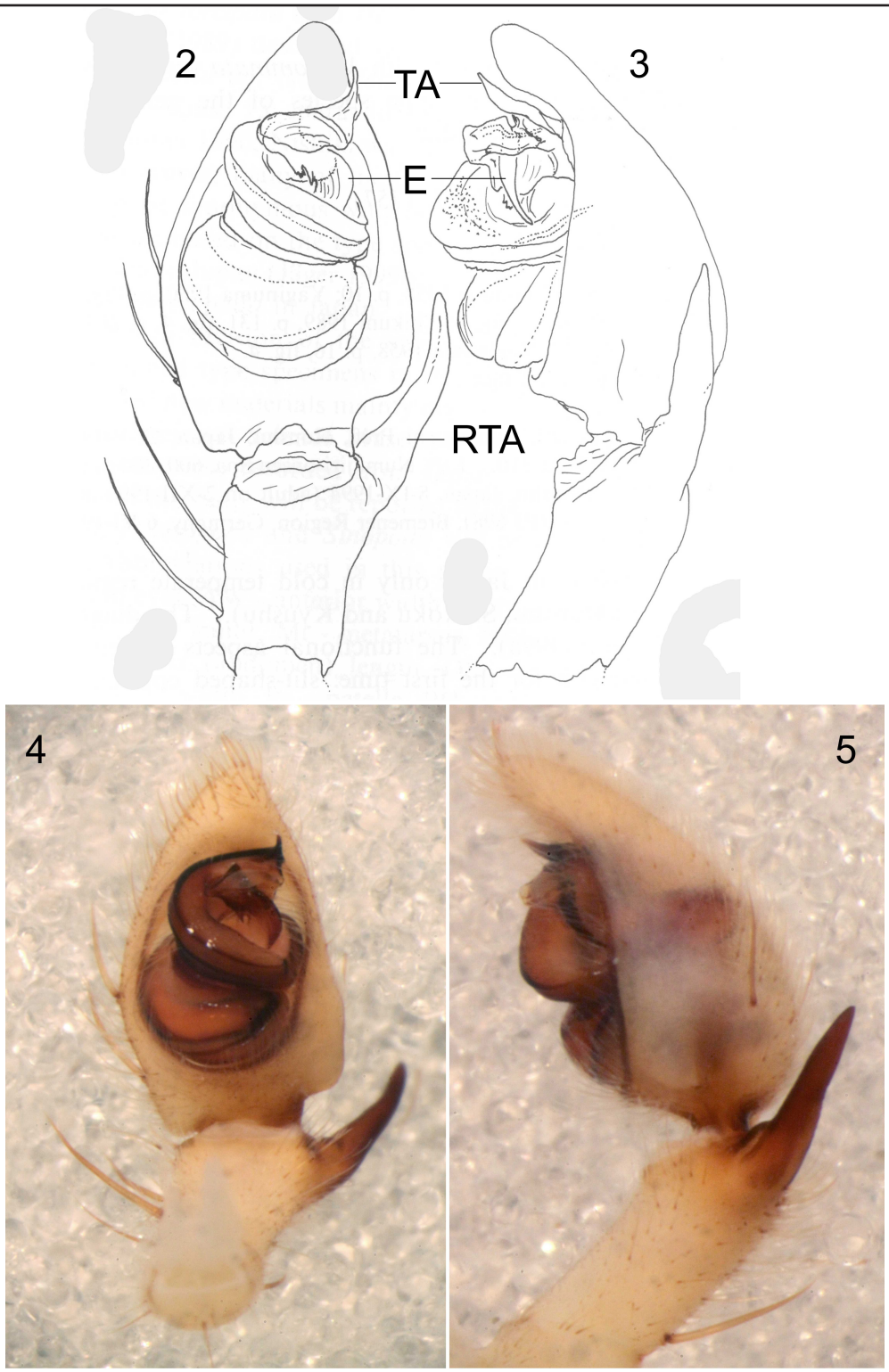


Figure 1 *Micrommata virescens*, male from Sweden (sub *Araneus roseus*) by Clerck (1757) with habitus and eye arrangement, both in dorsal view ("Fig. 1") and male palp in retrolateral view ("Fig. 2")



Figures 2–5 *Micrommata virescens*, males from Japan (2–3) and Austria (4–5) Palp, ventral view (2, 4), retrolateral view (3, 5). E — embolus, RTA — retrolateral tibial apophysis, TA — tegular apophysis.

Figure 6 *Draconarius magicus*, male from Vietnam. Palp, ventral view (Photo by S. Li).